FRANK J. SPRAGUE
AND THE
EDISON MYTH

BY
HARRIET SPRAGUE

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FRANK J. SPRAGUE
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EDISON MYTH

Whatever satisfies the soul is truth.
WALT WHITMAN

FOR MANY YEARS it was the intention of Frank J. Sprague to write a history of the pioneer electrical age in our country and its influence on our civilization but, although he wrote many authoritative articles, he never could withdraw from his scientific activities for a sufficiently long time to write the book. However, he collected a vast amount of authentic data, letters, historical documents and writings to be available whenever needed. Much of this material has been added to the Sprague Collections at the New York Public Library, the Engineering Societies Library and to other libraries and universities.

It is unfortunate that Mr. Sprague could not accomplish his purpose, for no one knew the pioneer history of individuals and events more accurately than he. Morever, he wrote clearly and to the point with absolute honesty and fair consideration for each participant. When dealing with matters concerning science, invention or engineering he became entirely detached as an individual, measuring friend and foe with equal fairness, solely as to their gifts and their achievements.

THE WHOLE WORLD owes a debt to Thomas A. Edison for his many important inventions and developments, but the exaggerated publicity concerning him has been especially questionable. He was not the only inventor of his period as has been sometimes represented. There were other great pioneers of the electrical age and each contributed a share in building our present civilization.

In order to enter a protest against further exploitation of false claims, it seems advisable to briefly summarize the question, and, as the Sprague inventions are the ones which are most frequently included in the Edison list, it is essential to outline some of the early Sprague history as well as to give the opinions of some of the most eminent and best informed among the associates and contemporaries of Edison and Sprague. I should be unfaithful to the confidence shown in trusting the important Sprague historical records to my care if I failed to act as urgency demands.

The frequently quoted Edison List was, I believe, first published in the authorized *Edison, His Life and Inventions,*[1] by F. L. Dyer and T. C. Martin:

STATISTICAL RESUME (APPROXIMATE) OF SOME OF THE INDUSTRIES IN THE UNITED STATES DIRECTLY FOUNDED UPON OR AFFECTED BY INVENTIONS OF THOMAS A. EDISON

	Investment
Central station lighting and power	$1,000,000,000
Isolated incandescent lighting	500,000,000
Incandescent lamps	25,000,000
Electric fixtures	8,000,000
Dynamos and motors	60,000,000
Electric railways	4,000,000,000
Telephone systems	800,000,000
Telephone apparatus	30,000,000
Phonograph and motion pictures	10,000,000
Motion picture theatres	40,000,000
Edison Portland cement	4,000,000
Telegraphy	250,000,000
Total	$6,727,000,000

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[1] Harper and Brothers, New York, 1910, page 703.

It should be noted that electric railway investments amount to four times as much as any other single item and more than half as much as the total amount.

This Edison List has been quoted widely in the press, in biographies and textbooks ever since publication. Over the radio some time ago, "The Benefit of Edison's Brains to the World" was described as totalling over $33,000,000,000. The list includes various key industries, founded and developed on the pioneer work of Morse, Bell, Charles F. Brush, Sprague and others, as of Edison parentage.

Surely there should be some way to stop such exploitation of one name with the effort to suppress all credit for the life work of other great men. The list was sent to the press all over the country in 1928 when Congress awarded the Congressional Medal to Mr. Edison. At that time, Mr. Sprague sent a letter to Congressman Randolph Perkins, cautioning him that inaccuracy or overstatement in citing Mr. Edison's many achievements in invention and industrial development would be a disservice, and suggesting that a committee from several of the Engineering Societies might be asked to phrase the exact wording of the award so that it would be beyond criticism or apology.

Mr. Perkins replied that he was very glad he had introduced the bill for this medal, "and of course it will pass. No member of Congress would dare to oppose an award to a man of Mr. Edison's great genius." He added that no one can write of Mr. Edison without overwriting and, in conclusion, "surely he deserves every sort of exaggeration."

There is no question that Edison made additions and improvements to the telegraph and to the telephone, but these industries are built on the basic inventions of Morse and Bell, just as the incandescent light is built on the basic Edison patents. A recent report says "the General Electric Company has contributed a hundred major developments and a thousand improvements to electric lighting." Most inventions are overlapping to a certain extent and in a broad sense are the work of many minds, but to the one who first conceived and carried through successfully a certain basic idea belongs the chief credit.

At the dedication of the memorial tablet to Thomas Davenport in 1910, Mr. T. C. Martin, co-author of the Edison book published in the same year, said, "To Sprague more than to any

other man is due our pre-eminence in the art and industry of electric traction on railroads and the electric elevator."

UNDER the heading "Scientists Ask Study of Edison's Failures," The New York *Times* published an article on April 16, 1947, about "The Thomas Alva Edison Foundation." The plan is to raise a fund of $2,590,000 (of which two contributions totalling $160,000 have been received) for the purchase and operation of the Edison library and laboratory at West Orange, New Jersey, and to train men in the "best method of organized research." . . . "An essential task of the Foundation will be the study and codification of Mr. Edison's voluminous notes."

A suggestion has been offered to a member of the committee that an important and helpful initial research plan would be to straighten out the Edison record, and to eliminate the exaggerated claims of an overzealous publicity department. Most certainly students would receive little benefit from a study of Edison inventions without having a factual record of what those inventions actually were, as well as a record of the work of the other great pioneers in electrical invention and development. If research historians can present a dependable record of the stupendous work really accomplished by one of the world's greatest inventors, they will have done an inestimable service in clarifying Edison's permanent place in history, assisting greatly in the future work of students and historians.

* * *

THE *Con-Edison News* says, "Thanks to Thomas A. Edison for electric light, heat and power . . . electric trains,"[2] and further on, "Edison invented the electric motor, and made possible the high speed electrically driven elevator which was an important factor in the development of our skyscrapers of today."[3] I sent a protest stating that thanks for electric trains, for the constant speed motor and for the high speed electric elevator making the skyscraper possible, should be given not to Edison but to Frank J. Sprague, known the world over as the "Father of Electric Traction," vertical as well as horizontal. I have not the slightest doubt that the information for the article was prepared "from what we (the Consolidated-Edison Company) considered to be reliable sources." But it is evident that it stemmed directly or indirectly from Edison propaganda sources.

[2] March-April, 1947, page 2.

[3] *Ibid.*, page 7.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

An earlier objection was sent to Metro-Goldwyn-Mayer executives concerning their interesting film, *Edison, the Man.* A certain amount of fictional treatment is, of course, necessary in a biographical film, but there can be no excuse for fictional treatment of known scientific facts, as the use in an Edison picture (directly following flashes of many of Edison's patent papers) of the words:

ELECTRIC MOTORS

in huge letters filling the entire screen, followed by another flash of a streamlined Multiple-Unit electric train. The implication of Edison priority and dominance in these fields is absolutely false and misleading.

One is reminded that Josh Billings said, "It is better to know nothing than to know what ain't true," and that William James wrote, "Humbug is humbug, even though it bear a scientific name."

* * *

An item of special interest in my treasured collection is a printed diagram designed by Wm. J. Hammer, manager and electrician of the Edison Company of Boston, and published in the *Electrical World,* September 3, 1887, under the heading, "Distribution of Power by Sprague Motors in Boston." A large wheel is represented with spokes radiating from the center hub. Between the spokes are printed details of seventy-four various industries in Boston using Sprague motors. Within the center hub is printed in large type:

Electric
Transmission of Power
by
Sprague
Automatic Motors
at
"The Hub"
designed by
Wm. J. Hammer

Below is an explanation that "Bostonians are very much given to speaking of their city as the 'Hub of the Universe' " and Mr. Hammer "has appropriated the idea for the Sprague motor in regard to the transmission of power from the Edison station in that city."

DR. E. HUBER-STOCKER, eminent Swiss authority and author of *The Electrification of Swiss Railroads,* wrote in a letter of January 1, 1928, of a published article by him:

> The pages allowed being so few, I could mention only two inventors in the field who have posted the most remarkable milestones, Robert Davidson, the builder of the first electric vehicle called locomotive (1839) and Frank Sprague twice, Richmond trolley railway (1887/8), and multiple-unit control (1897).

In the recently published *Engines of Democracy,*[4] the distinguished author, Roger Burlingame, says of early electric railway work:

> The Edison experiments like all other efforts in this direction became insignificant beside the immense achievements of Frank Julian Sprague, the inventor who has rightly been called the "father of electric traction."

Of Edison:

> The mythology, founded in great achievement, went on, however, gaining momentum and falsehood with every year. He was honored and decorated, a sense of his greatness was forced upon him; he accepted it with reluctance, but no man can resist such pressure. Often when he was given credit for something like electric traction which belonged, *in toto,* to others he seems simply to have refused comment.[5]

There are many other significant statements in the Burlingame book—for which Dr. Carl W. Mitman of the Smithsonian Institution undertook a careful critical review of the manuscript.

This authoritative Burlingame book and *The Story of General Electric; Men and Volts,*[6] by John Winthrop Hammond,

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[4] Charles Scribner's Sons, New York, 1940.

[5] *Ibid.,* page 247.

[6] J. B. Lippincott Co., 1941.

give interesting and important historical records of early invention. In the latter:

> . . . the motor this young enthusiast (Sprague, 1883) finally put together was to lead the way for electricity across the boundaries of illumination and into the vast field on the other side of the fence—the field of electric power.[7]
>
> Nothing tangible came of Edison's adventure into the realm of electric railroading, nor of the joint three-ton locomotive which he produced with Stephen D. Field in 1883 to appear under the name of "Judge" at the Chicago Exposition for Railway Appliances. The locomotive was supplied with current from a third rail and had a Weston dynamo for a motor.[8]
>
> Edison, with his incomparable system of incandescent lighting, utilizing only the direct current, Brush, Thomson, and Wood, the great arc-light pioneers, ready to exploit the alternating current as well as the direct—these four constituted the great pioneers in the nation's electrical illuminating field. All of them had given some thought to electric power. But none of them, even as late as the middle eighties, had expressly designed an electric motor as such, nor made a business of developing electric motors for stationary work.[9]

There is a full-page picture entitled, "The Birth of Electric Rapid Transit," with the caption, "Sprague demonstrates his multiple-unit control on the test track at Schenectady."[10]

The Edison and Sprague articles in *Who's Who in America* and the splendid *Dictionary of American Biography,*[11] or the complete eleven-volume *Centenary Edition,*[12] offer instructive reading.

BRIEFLY, as part of the record, Frank J. Sprague was born in Milford, Connecticut, July 25, 1857. When he was eight years old his mother died, the home was broken up and Frank with his younger brother, Charles, went to live with his aunt in North Adams, Massachusetts.

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[7] *Ibid.,* page 63.
[8] *Ibid.,* page 77.
[9] *Ibid.,* page 115.
[10] *Ibid.,* opposite page 230.
[11] Charles Scribner's Sons, New York, 1944. Volume xxi, supplement one.
[12] Charles Scribner's Sons, New York, 1946.

When a student there at the Drury High School, the principal advised his taking an examination for Annapolis, because of his unusual mathematical gifts. After winning a competitive examination in 1874, he spent four years at the Naval Academy, excelling in mathematics, chemistry and physics. Following graduation, he sailed with the Navy on a world cruise. Much of the time he was dreaming of electric motors, returning with a notebook filled with drawings and plans for fifty-seven varieties of inventions.

In 1880 he passed his examination as midshipman and did experimental work at Stevens Institute and Brooklyn Navy Yard; then he worked with Professor Moses G. Farmer at Newport, inventing the "inverted" type of dynamo and the series paralleling of armature circuits. In the summer of 1881, before his twenty-fourth birthday, he applied and finally managed to get orders to the U.S.S. *Lancaster,* with permission to go on leave to the Crystal Palace Electrical Exposition in England for three months at his own expense.

On the passage over, he busied himself with the first crude electric call-system in our service. Finally reaching London with twenty dollars in his pocket, he reported to the exhibition authorities. He was made secretary to the jury composed of distinguished scientists and was able to initiate an extended series of tests of dynamos, electric lights and gas engines on which he made an elaborate technical report to the Naval Department, which probably saved him from court martial for overstaying his orders about six months.

The *Report on the Exhibits at the Crystal Palace Electrical Exposition,* 1882, was published in Washington, D. C., 1883, by the Navy Department. It was a book of 169 pages of text with numerous original illustrations, charts and diagrams. It has been considered a remarkable opus for a twenty-five-year-old ensign.

His interest in electric railways dated from the time of his duty in England. In the spring of 1883, Sprague returned to the United States, and for a few months was engaged with Mr. Edison in connection with his electric light work, being fortunate enough to devise a mathematical method of determining the proper sizes of mains and feeders in central station installa-

tions, which although changing previous conceptions was promptly adopted.[13]

Resigning from the Edison Company, he founded the Sprague Electric Railway and Motor Company in the spring of 1884. The Company was principally a paper one in which he became the electrician, office boy, treasurer, mechanic and administration man—but it made good headway.

In 1884 the first electric exhibition in the United States was held at Philadelphia, and among the exhibits was one by the combined Edison companies. But this included no electric railway, and apparently no motor except "new Sprague" machines used to drive looms. The particularly novel characteristic of this type was that it ran at the same speed on all loads, and the non-sparking point of the brushes was also maintained constant.

These and the regular Sprague exhibit attracted unusual interest and attention, with many laudatory comments by scientific men, among them Sir William Preece and Professor Sylvanus Thompson, the latter stating that:

> By far the most important of all exhibits of their class is that of Mr. F. J. Sprague, which shows a very great advance on anything hitherto accomplished.

In the Philadelphia *Press* of September 21, Mr. Edison stated:

> The problem of transmission of electrical force has been pretty well worked out. A young man named Sprague, who resigned his position as an officer of our Navy to devote himself to electrical studies, has worked the matter up in a very remarkable way. His is the only true motor; the others are but dynamos turned into motors. His machine keeps at the same rate of speed all the time, and does not vary with the amount of work done, as the others do.

In an interview in *The Mail and Express* of November 22, 1884, Mr. Edison said:

> I have not given much thought to the substitution of electricity for horses on surface street cars.

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[13] A portion of this particular account is taken from AERA, February, 1932, official publication of the American Electric Railway Association.

The pioneer electric railway work in progress at this period culminated in the successful equipment by Sprague of the famous Richmond Union Passenger Railway, contract for which was made in May, 1887. Experimental operation began in the fall, and for fares February 8, 1888. On May 4th—which has since been designated "National Railway Day" by the American Electric Railway Association—30 cars were put in operation and soon afterwards 10 more, despite widespread prediction of failure.

The success of this installation initialed the most extraordinary industrial revolution in transportation up to that time, and is universally admitted to mark the date of the creation of the modern electric railway, contracts being made for the equipment of over 200 railways within two years, 113 of them by the Sprague Company.

The success of the Sprague Company in both the industrial and traction field had rapidly become so pronounced that the newly formed Edison General Electric Company, after investing nearly $400,000 in the Sprague Company, with a contract for manufacture of part of its equipment, decided to acquire full control. To this end, in the latter part of 1889 an invitation circular was issued to the stockholders of the Sprague Electric Railway and Motor Company by its president, Edward H. Johnson, past president of the Edison Electric Light Company and a trustee of the Edison General Electric Company, which after emphasizing what Mr. Edison had done in the development of the incandescent light and the central station, stated:

> He had not, however, provided a commercial motor wherewith to reconvert the electric energy into motive power, and thus utilize it for manufacturing and industrial enterprises, and more especially to the propulsion of street railway and tram cars. It was a knowledge of these facts that led the undersigned to evince an interest in the ideas and inventions of Lieutenant Frank J. Sprague, which interest resulted in the formation of the Sprague Electric Railway and Motor Company, based upon the patents of Mr. Sprague, whose complete success in evolving the required electric motor and system of electric street railways is now fully recognized.

Control of the Sprague Company being secured, the fact was announced by the Edison Company in its annual report in 1889, in the following words:

> The business given by the Sprague Company to the machine works showed such an extraordinary increase during the past Summer and Fall that your Board of Trustees deemed in their duty to make an effort to bring about a practical consolidation of the two interests. . . . The company has been so successful that out of the 200 electric street railways now in operation or in the course of construction in the United States, the Sprague Company has equipped more than one-half, and over 90 per cent of the entire number are operated on the general plan originally laid down by the company as the pioneer in this field of electric work, and are based upon its patents. . . . There are at present in use nearly 3,000 Sprague motors of all classes, applied to no less than 150 different industries.

At the time this statement was issued not a mile of track of a commercial electric railway had ever been laid by Mr. Edison, and not an Edison railway motor was in operation on any electric car in the world; the industry had been thoroughly established and electric traction had come into its own, chiefly through the success at Richmond.

But the Sprague name was dropped, another substituted.

There now appeared, by whomsoever designed, a "new Edison Motor," a single geared one with a Gramme ring armature, soon to be put aside. But the real so-called "improvement" was a recrudescence, for street railways, of an early idea of current supply through running rails only, but this time at only 20 volts potential, supplied from motor generators. Its astounding fallacies were a repetition of the age-old prophecy of the early demise of the steam locomotive; electric operation of main line railways with a third rail impossibly positioned in the center of the tracks, and of street railways—"the poser"—by running rail supply at so low a pressure that neither man nor beast could feel it, but yet which could be picked up "through two inches of mud." The impracticability of the proposed scheme was tersely indicated by the comment of Dr. Elihu Thomson, whose

dictum was that the system "did not have a ghost of a chance to survive."

This was three years after the Richmond success, and when 412 companies in the United States alone, over 40 per cent of the total, were already electrically operating 6,732 cars over 3,000 miles of track on the Sprague plan.

In 1895, Sprague created the multiple-unit system of electric train control, and two years later it was installed on 120 cars on the South Side Elevated Railroad in Chicago, on a contract originally personal, which equipment, after a half century is still in operation. Its successful demonstration in the face of practically universal predictions of impracticability and failure, its subsequent world-wide adoption, and its epochal influence upon electric traction are too well known to need much comment.

As NOTED earlier, while associated with the Edison Company in 1883-1884, Mr. Sprague devised a mathematical method of electrical distribution. This was patented and assigned to the Edison Company. In this connection it seems fitting to quote from an address of Mr. Philip A. Lange, Westinghouse representative in London, delivered at a dinner of the Engineers' Club of Manchester, England, March 15, 1907:

An Event in Electrical Development

> A few weeks ago a gentleman asked me what I considered to be the most important event in the history of electrical development. In reply I stated that to my mind there were three events of almost equal importance: the invention of the incandescent lamp, the discovery of the electric motor, i.e., the reversibility of the dynamo, and the invention of the induction motor.
>
> Since then I have given more thought to the matter, and my opinion has changed. If asked the same question today, I should answer, the advent of the young man with a college training into the electrical field. In the early days of the electrical industry, if it was desired to lay out the wiring for lighting a city, the process adopted by the Edison Company was as follows:
>
> A huge map was prepared, showing the location of the

streets and the position of the houses where current was to be supplied. On this map, a spool of German silver wire was located wherever a house was to be supplied with lights. Each spool had a resistance proportional to the resistance of the lamps in the house. Wires corresponding to the feeders to be actually used were stretched along the streets, and the German silver spools were connected to these wires. Current was obtained from a small Daniel battery, and distributed to the different spools through the wires. A professor then sat in front of the map and measured with a galvanometer the drop along each of the wires. From his measurements, the proper wires for running along the streets of the city could be determined.

After this system had been in use for two years or more, Mr. F. J. Sprague joined the Edison forces. He was the first man among us with a technical education who had made a special study of electricity. He quickly showed how to calculate the drop in feeders without laying out a whole city in miniature, determining in a few hours or minutes results which had previously required weeks of experimental work and a considerable outlay.

This is only one of many cases which could be cited where the technically trained man has shown the possibility of predicting results theoretically which previously had to be determined experimentally, at very great expense, and I am convinced that the entrance of the college man into electrical engineering has been the most important event in the history of the industry.

THE FOLLOWING extract from an article by Frank J. Sprague appeared in the New York *Times*, September 23, 1928:

> The Magazine of the New York *Times* of August 21 contained an article entitled "The Magic Edison Made for the World," in which it was stated that Henry Ford plans the resurrection of Menlo Park as an Edison memorial because it was the birthplace, in a decade, of three inventions whose "wizardry has changed civilization"—the phonograph, the electric light and the electric railway; that there was run the "first electric car of the new era, really a train,"

and here was begun the "trolley age." Emphasis was laid upon the dynamo-electric machine, with suggestion of first successful use of its reversible function, in that "his motor that ran the electric car was replacing steam everywhere."

Similar claims have appeared in various publications, but in so far as they refer to the industrial motor and the electric railway they are in many respects inane and in others untrue, the reason for a reiteration which has become an obsession being, possibly, the fact that the use of electricity for power has far outstripped its use for electric lighting, and its influence upon our modern existence is incalculable.

Mr. Edison created the modern system of incandescent lighting, thereby conferring a lasting boon on humanity—testimony to which, and his courage, ingenuity and persistence, I have often voiced. But granting the fullest measure of credit in this field, the fact remains that claims made by or for him that he created the industrial motor and "invented" and "perfected" the electric railway and trolley system are quite unwaranted, and are founded upon lack of knowledge or an exaggerated complex with regard to relatively unimportant experiments which exhibited neither originality in ideas nor continuity of influence.

As my own work in the use of electricity for the transmission of power for whatever purpose has been somewhat comprehensive, I must in common justice to myself, as well as others, protest the maintenance of an industriously cultivated fetish.

Any work claimed as epochal must be judged by its originality and its subsequent influence. Measured by these requirements, the railway experiments at Menlo Park in 1880 and 1882, however much exploited, may as well never have been made, for they disclosed little of novelty and were absolutely without influence upon the extraordinary developments of the art in later years. As installed, the equipments were and are prohibitive of practical application to electric operation. There was no novelty in using the rails for current supply and collecting it by running contacts, nor in the use of the dynamo as a motor.

THE Sprague Multiple-Unit System is in use the world over on rapid transit and interurban roads, also on electric trunk line

railways where two or more power units are under a common control. Without it rapid transit as we know it would be impossible.

On May 16, 1911, the American Institute of Electrical Engineers presented its highest award, the Edison Medal, to Frank J. Sprague. There were addresses by Dr. Elihu Thomson and the President, Dr. Dugald C. Jackson, who concluded his eulogy with the words, "on the grounds of his electric-motor inventions and his traction accomplishments, I am authorized to confer on Mr. Sprague the second Edison Medal conferred in the history of its foundation."

THE electric elevator was another major Sprague interest. The New York *Telegram,* February 14, 1931, said:

> Frank J. Sprague, pioneer of the electric elevator, deserves credit for paving the way for present and prospective achievement in vertical transportation. . . . His installation of an electrically operated elevator in 1884 was the first in which constant speed was maintained, regardless of load.

At that time the hydraulic elevator was supreme and Sprague had a long, hard fight against powerful opposition. He developed two different types of electric elevator (the drum type and the screw type) which challenged the supremacy of the hydraulic; and he invented the push button type of control with interlocking circuits through the car and landing doors, the basis of the present "signal control," thus laying the foundation of modern electric elevator practice.

In 1892 the Sprague Electric Elevator Company was formed and the first battery of Sprague-Pratt elevators was installed in the Postal Telegraph Building. About 600 elevators were built, the equipment of the highest buildings as well as the largest installation, that for the Central London Railway elevators. Then the business was transferred to the Otis Elevator Company.

In 1927 Sprague returned to the elevator field, developing a dual elevator system which provided for the operation of two elevator cars, express and local, in a single shaft. The engineering problems involved in the working out of this idea were extremely difficult, but they were solved, a Sprague patent issued

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

and a dual elevator installed in the main office of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pennsylvania.

* * *

Early in 1932, several of Frank J. Sprague's former associates decided to arrange a special celebration in recognition of his seventy-fifth birthday. Frank H. Shepard, of the Westinghouse Company, who had been his right-hand man during the first application of the multiple-unit system on the South Side Elevated in Chicago in 1897-8, started the ball rolling, kept it rolling through several months of careful planning which resulted in a most notable occasion on the evening of July 25. He appointed an informal committee, W. B. Potter, of the General Electric Company, Frank Hedley, President of the Interborough Rapid Transit Company, and Guy A. Richardson, President of the American Electric Railway Association, which met for discussion of plans. Mrs. Sprague and Miss Blanche McLaughlin, for many years Mr. Sprague's efficient secretary, were invited to join these meetings.

Friends and associates were asked to send letters and photographs. The response was enthusiastic; about five hundred letters with photographs were received. These were handsomely bound in six large volumes.

When work was well under way, Mr. Shepard and his committee organized the Frank J. Sprague Anniversary Committee, consisting of the presidents of the several engineering societies, presidents of universities which had given Mr. Sprague honorary degrees, a number of his early associates and many men prominent in electrical science and industry, with Dr. Gano Dunn, President of the J. G. White Engineering Company, as chairman, Philip Torchio, Senior Vice-President of the New York Edison Company as treasurer, and Dr. Cary T. Hutchinson as secretary.

The guest of honor knew nothing of the plans until a short time before the meeting, at which time the splendid books were presented as a complete surprise.

On the evening of the birthday, the large Auditorium in the Engineering Societies Building was filled. An unusual atmosphere

of enthusiasm, admiration and affection was felt by all present. Chairman Gano Dunn felicitously presented the speakers.

Dr. John H. Finley, of the New York *Times*, with distinction and charm, made the opening address:

> I find myself, may I say informally, somewhat out of character here tonight. I am generally introduced as a pedestrian, and as a pedestrian I am paying homage to the pioneer of rapid transit.

After many amusing classical references and definitions of the Greek *far* words, he added:

> But you, Mr. Sprague, have made a unique contribution in that you have through your persistent and triumphant inventing . . . conquered *far* by the use of electricity in two directions: perpendicular and horizontal. . . .
>
> One thinks of you, first of all as a human "uplifter" in the sense, the physical sense, that your invention made possible the carrying of millions by "lifts" every day to heights never dreamed of before your day.

Mr. Frank H. Hedley spoke with force and authority of the noteworthy contributions of Sprague to transportation:

> Frank Sprague is the Father of Electric Traction. . . . He installed in Richmond, Virginia, in 1887 the first electric railway of any size in the world. This, the parent of all modern trolley lines, brought a revolution in transportation. The invention of the multiple-unit system of transportation a few years later marked a new epoch in transportation. . . .
>
> From 1903 to 1907 he served as a member of the Commission for the Electrification of the New York Central and was responsible for many of the decisions in connection with the important project. . . .
>
> In recent years he has been active in the development and construction of his automatic train control system which takes control out of the hands of the operator of the train only when he makes a mistake.

Then Admiral S. S. Robison made an eloquent address describing Sprague's career as a naval graduate, and his many ac-

tivities, including membership on the Naval Consulting Board during World War 1:

> He is well called inventor, scientist, engineer. To these should always be added courage. "The will to conquer."

Mr. Sprague, deeply moved, responded, telling of many experiences, paying warm tribute to his loyal associates, to the great engineering profession and to the Navy.

Admiral Robison then gave a radio address over the National Broadcasting Company wires, "A Tribute to Frank J. Sprague, Father of Electric Railroads."

A reception followed the meeting.

The space allows only this brief mention of the splendid addresses given. These were printed in full, together with names of committees and a list of the five hundred friends who had sent letters and photographs for the occasion. Copies of the souvenir volume were sent to each of the writers.

The six volumes have been described as the most notable collection of letters and pictures of the great men of the time in science, industry, the arts and letters. Reminiscences and tributes contained in these letters cover the whole period of Sprague activities from his Naval Academy days on.

The following three letters are given, permission having been granted by the writers. It is to be regretted that many more of the fine letters cannot be included—but lack of space forbids.

From the late Benjamin E. Sunny, prominent financier and business executive:

Chicago, Illinois, May 16, 1932

Dear Doctor Sprague:

He invented the Multiple-Unit System and applied it to the South Side Elevated in 1898.

I was the manager of the General Electric in Chicago at the time, and we had the business of the elevated railroad in motors, etc., for some years, and a contract for equipment had been negotiated which contemplated an addition to the old method, the only one known of a heavily serviced car capable of pulling a number of trains.

I called on Mr. Hopkins, the general manager, one morn-

ing, expecting to receive the signed contract, but found him in rather a bad humor. One of the directors had met a fellow in New York with a military title who had put in an electrically equipped dumb waiter, for delivering cocktails to the several floors in a big hotel, which worked perfectly, and he proposed to apply the same scheme to the operation of elevated trains. This seemed to us to be just too funny for anything, and we both had a good laugh over it.

Mr. Hopkins telephoned the next day that the name of the magician was Lieutenant Frank Sprague, and then it wasn't so funny. Your fame in electrical railways was widespread, and you were a terrible man in competition. I saw that fine contract, in those days of bad business following the '94 panic, slipping away, and it made us all feel pretty sad.

Well, you came to Chicago, and the story was that you had no shop, no organization, no installers—just a toothbrush and an idea, but, ye Gods, what an idea; most men with an idea like that would not have had the presence of mind to carry even a toothbrush additional.

We lost the contract, you won, and it was a great day for railway transportation; for the application of your multiple-unit system has been the greatest boon that has come to that most important public service. Indeed, the wonderful results could not have been secured in any other way.

I am free to confess, dear Frank, that I did not give you favorable mention in my prayers at night, and for a few days I spoke your name hissingly! But all the world loves a winner, and I had the pleasure of congratulating you many times since as the years have further unfolded all the enormous utility and value of your invention.

On your seventy-fifth anniversary, I send you my affectionate greetings, and my sincere good wishes for many more years of health and happiness.

Yours sincerely,
B. E. SUNNY

The late Starling W. Childs, New York financier and philanthropist, in a letter dated May 23, 1932, referred to his father-in-law, Charles A. Coffin, Founder, former President, then Chairman of the Board of the General Electric Company:

The General Electric Company looked upon your Multiple-Unit control patent (which it then owned) as about the most valuable of its patent rights; and Mr. Coffin also told us that in the General Electric Company they placed you as an inventor at the top of the American field—which meant the world. They felt that in your work there was a definiteness and practicality which has never been equalled, even by the "Wizard of Menlo Park."

The following letter from the late J. H. Van Alstyne, President of the Otis Elevator Company, was dated June 11, 1932:

> My Dear Mr. Sprague:
>
> Permit me to offer you my most sincere congratulations upon this occasion of your seventy-fifth birthday.
>
> I deem it a great honor to have been connected, even in a very minor capacity, with one of your great achievements, and that was the Sprague Electric Elevator. It was back in 1898 when the great elevator installations of that time were being installed and the apparatus you designed inaugurated the passing of the hydraulic elevator and the development of the high speed electric type.
>
> I appreciate that the elevator development was only one field which had the benefit of your great activities. Nevertheless as you look about the great cities of the world it must be a tremendous satisfaction to know that you were the first to break down the limitations of the hydraulic elevator and open the field to the electric type which was necessary to permit the great buildings of this time.
>
> With the sincere wish that you may have many more years of activity, I remain,
>
> Very truly yours,
>
> J. H. VAN ALSTYNE

* * *

FRANK J. SPRAGUE died October 25, 1934, and was buried in the National Cemetery in Arlington, Virginia, with full Naval honors.

There were numerous articles and obituaries published throughout the United States and in some European countries. From the New York *Herald Tribune,* of October 27, 1934, we quote the following editorial:

> Father of the Trolley Car
>
> The death of Frank J. Sprague removes the third of a remarkable trio of American inventors who made notable the closing quarter of the last century. Perhaps no three men in human history have done more to change the daily lives of humankind. Certainly no three have been responsible for greater progress in use of electricity. Edison, the telegrapher, made it possible for human beings to work or play at night with cheap electric light. Bell, the singing teacher, took the first steps in that vast development of telephony and radio which now makes it possible for one person almost anywhere in the world to converse with another person almost anywhere else. Sprague, the young naval officer, dreamed of railways and street railways run cheaply and safely by this motive power of electricity and made his dream come true. All three men might stand as models of the peculiar practical genius of America. There were electric lamps before Edison. There were telephones of a sort before Bell. There were electric motors before Sprague. But these three men made these three things work.
>
> A year ago last July Mr. Sprague himself described that incredible adventure in Richmond in 1887 which resulted in the first electric street railway. Promoters in the Virginia city had obtained a franchise and had constructed something that passed for a track. Only three years out of the Navy, young Sprague had a small business building motors. Plans for a street railway had been worked out in his head, but nothing of the kind ever had been built. All experimental cars and other electric vehicles then in existence anywhere did not total the forty street cars required to start the Richmond line. Yet Sprague and his associates took a contract to supply the cars and electrify that line in ninety days. What is still more remarkable, they did it.
>
> That was the beginning of practical electric transportation, yet Mr. Sprague's fame in future engineering probably

will rest less on that than on the development which Mr. Frank Hedley has mentioned as foremost in the long list of Sprague inventions. This is the multiple-control system by which several motor cars of an electric train, such as a subway train, all are operated at once from the cab of a single motorman. In city transportation this is necessary, both to provide trains of any required number of cars and to make possible the rapid starting needed for speed on lines with many station stops. Vertical transportation by electric elevators also owes much to Mr. Sprague's inventions. Not merely as father of the trolley, but of all transportation by electricity, his fame is firm.

* * *

In May and June, 1938, the New York Public Library offered a comprehensive exhibition of "Papers, Drawings and Pictures" from their Sprague Collection—effectively arranged to illustrate the important periods in Mr. Sprague's life and work.

Recognition of Frank J. Sprague's contributions to the world through science and invention include honorary degrees from Stevens Institute of Technology (D.Eng.), Columbia University (D. Sci.) and the University of Pennsylvania (LL.D.); the Gold Medal from the Paris Electrical Exhibition, 1889; the Elliott Cresson Medal from the Franklin Institute, 1903 ("For the development of the multiple-unit system of electric traction."); the Grand Prize from the St. Louis Exhibition, 1905; the Edison Medal from the American Institute of Electrical Engineers, 1910; the Franklin Institute Medal, 1921 ("For many and fundamentally important inventions and achievements in the field of electrical engineering; notably contributions to the development of the electric motor and its application to industrial purposes and in the art of electric traction, signally important in forming the basis of world-wide industries and promoting human welfare."); and honorary membership in the Franklin Institute, 1921.

On the occasion of the award of the Franklin Institute Medal and Certificate of Honorary Membership to Mr. Sprague, the address was made by Mr. W. C. L. Englin, from which the following brief quotations are offered:

> His notable work in 1887 for the Union Passenger Railway Company of Richmond marked the first successful electric street railway system. In this undertaking, Mr. Sprague designed the first complete system including the power house, the transmission and distributing system, and the electrical equipment on the cars; which later became the standard practice for street-car equipment throughout the world. . . . Mr. Sprague has been a pioneer in the invention and development of transportation for both freight and passengers, for all classes of railroad service, and to him is due the great development which has been made in the progress of the art. . . . His marked inventive and constructive ability made possible the electric elevator which is now almost universally used for both passenger and freight purposes. The development of the electric motor and its application to industrial purposes and in the art of electric traction, have done much to increase the establishment of world-wide industries and have greatly helped in promoting human welfare. Mr. Sprague has had the good fortune to live to see his discoveries and inventions applied to this art of electric traction throughout the world.

In 1932 Mr. Sprague was awarded Honorary Membership by the American Institute of Electrical Engineers, and on October 19, 1934, he was presented with the John Fritz Medal by representatives of four national engineering societies having more than sixty thousand members ("For distinguished service as inventor and engineer through the application and control of electric power in transportation systems").

He had served as president of the American Institute of Electrical Engineers, the New York Electrical Society, the American Institute of Consulting Engineers, the Inventors' Guild, and was a member of many other societies.

The various Engineering Societies sent the Sprague family impressive and beautiful *Memoirs* of their late member. One from the Society of Naval Architects and Marine Engineers was handsomely bound, with engrossed and illuminated text from which we quote briefly:

> His inventive genius in the development and application of electricity to transportation, his vision, courage and zeal in

the promotion of his inventions, place him as one of the outstanding pioneers in the field of human endeavor. His life's work has meant a revolution in transportation with its far-reaching consequences. . . . While the world will remember Frank J. Sprague as a great engineer, his friends will recall the charm of his personality, his congenial and helpful spirit. Few men were ever so richly endowed with so fine an adjustment of qualities of mind and heart that won admiration and respect for accomplishment and a loyal and lasting devotion of friends.

* * *

In Memory of two great inventors and of the many others whose inventive genius helped to create our present civilization and the industrial age, let us hope that it may now be possible to close the books on all controversy and offer deserved tribute to each.